CHAPTER 6

Mathematical Operations

This section deals with questions on simple mathematical operations. Here, the four fundamental operations – addition, subtraction, multiplication and division and also statements such as 'less than', 'greater than', 'equal to', 'not equal to', etc. are represented by symbols, different from the usual ones. The questions involving these operations are set using artificial symbols. The candidate has to substitute the real signs and solve the questions accordingly, to get the answer.

6.1 Problem solving by substitution

In this type, you are provided with substitutes for various mathematical symbols or numerals, followed by a question involving calculation of an expression or choosing the correct/incorrect equation. The candidate is required to put in the real signs or numerals in the given equation and then solve the questions as required.

Note : While solving a mathematical expression, proceed according to the rule BODMAS i.e., Brackets, Of, Division, Multiplication, Addition, Subtraction.

Solved examples

Ex.1 If '+' means 'minus', '×' means 'divided by', '÷' means 'Plus' and '–' means 'multiplied by', then which of the following will be the value of the expression $252 \times 9 - 5 + 32 \div 92$?

(1) 95 (2) 168 (3) 192 (4) 200

Sol. Putting the proper signs in the given expression, we get :

$252 \div 9 \times 5 - 32 + 92 = 28 \times 5 - 32 + 92 = 140 - 32 + 92 = 232 - 32 = 200$

Hence, the answer is (4).

Ex.2 If L stands for +, M stands for –, N stands for ×, P stands for ÷, then 14 N 10 L 42 P 2 M 8 =?

(1) 153 (2) 216 (3) 248 (4) 251

Sol. Putting the proper signs in the given expression, we get :

$14 \times 10 + 42 \div 2 - 8 = 14 \times 10 + 21 - 8 = 140 + 21 - 8 = 161 - 8 = 153.$

Hence, the answer is (1).

Ex.3 If 20 – 10 means 200, 8 ÷ 4 means 12, 6 × 2 means 4, then $100 - 10 \times 1000 \div 1000 + 100 \times 10$ =?

(1) 0 (2) 20 (3) 1090 (4) 1900

Sol. Given that : 20 – 10 = 200. But, actually $20 \times 10 = 200$. So, – means ×

Given that : 8 ÷ 4 = 12. But, actually 8 + 4 = 12. So, ÷ means +.

Given that : $6 \times 2 = 4$. But, actually 6 – 2 = 4. So, ×means –.

Thus, in the given mathematical language, – means ×, ÷ means + and ×means –. So, + means ÷. Putting the correct signs, we have :

Given expression $= 100 \times 10 - 1000 + 1000 \div 100 - 10 = 1000 - 1000 + 10 - 10 = 0.$

Hence, the answer is (1).

Ex.4 It being given that : > denotes +, < denotes –, + denotes ÷, – denotes =, = denotes 'less than' and ×denotes 'greater than ', find which of the following is a correct statement.

(1) $3 + 2 > 4 = 9 + 3 < 2$ (2) $3 > 2 > 4 = 18 + 3 < 1$

(3) $3 > 2 < 4 \times 8 + 4 < 2$ (4) $3 + 2 < 4 \times 9 + 3 < 3$

Sol. Using proper notations, we have :

(1) Given statement is $3 \div 2 + 4 < 9 \div 3 - 2$ or $\frac{11}{2} < 1$, which is not true.

(2) Given statement is $3 + 2 + 4 < 18 \div 3 - 1$ or $9 < 5$, which is not true.

(3) Given statement is $3 + 2 - 4 > 8 \div 4 - 2$ or $1 > 0$, which is true.

(4) Given statement is $3 \div 2 - 4 > 9 \div 3 - 3$ or $-\frac{5}{2} > 0$, which is not true.

Hence, the answer is (3).

EXERCISE

1. If '<' means 'minus', '>' means 'plus', '=' means 'multiplied by' and '$' means 'divided by', then what would be the value of 27 > 81 $ 9 < 6?

(1) 6 (2) 33 (3) 36 (4) None of these

2. If × means –, + means ÷, – means × and ÷ means +, then 15 – 2 ÷ 900 + 90 × 100 =?

(1) 190 (2) 180 (3) 90 (4) None of these

3. If '–' stands for 'division', '+' for 'multiplication', '÷' for 'subtraction' and '×' for 'addition', then which one of the following equations is correct?

(1) 4 × 5 + 9 – 3 ÷ 4 = 15 (2) 4 × 5 × 9 + 3 ÷ 4 = 11

(3) 4 – 5 ÷ 9 × 3 – 4 = 17 (4) 4 ÷ 5 + 9 – 3 + 4 = 18

4. If '+' stands for 'division', '÷' stands for 'multiplication', '×' stands for 'subtraction' and '–' stands for 'addition', which one of the following is correct?

(1) 18 ÷ 6 × 7 + 5 – 2 = 22 (2) 18 × 6 + 7 ÷ 5 – 2 = 16

(3) 18 ÷ 6 – 7 + 5 × 2 = 20 (4) 18 + 6 ÷ 7 × 5 – 2 = 18

5. If '×' stands for 'addition', '<' for 'subtraction', '+' for 'division', '>' for 'multiplication','–' for 'equal to' , '÷' for 'greater than' and '=' for 'less than', then state which of the following is true?

(1) 3 × 4 > 2 – 9 + 3 < 3 (2) 5 × 3 < 7 ÷ 8 + 4 × 1

(3) 5 > 2 + 2 = 10 < 4 × 8 (4) 3 × 2 < 4 ÷ 16 > 2 + 4

Direction (Q.6 & Q.7) : In each of the following questions, some symbols are represented by letters as shown below.

+	–	×	÷	=	>	<
B	G	E	C	D	A	F

Now, identify the correct expression in each case.

6. (1) 18 C 3 D 6 B 8 C 4 G 12 (2) 18 A 3 E 6 B 8 G 4 B 12

(3) 18 C 3 G 6 B 8 B 4 D 12 (4) 18 F 3 B 6 E 8 G 4 E 12

7. (1) 15 B 5 G 8 B 4 G 6 F 3 (2) 15 C 15 B 8 F 4 B 6 C 3

(3) 15 A 5 E 8 C 4 B 6 E 3 (4) 15 C 5 F 8 C 4 B 6 C 3

Direction (Q.8 to Q.12) : In each of the following questions, different alphabets stand for various symbols as indicated below :

Addition : O Subtracton : M Multiplication : A

Division : Q Equal to : X Greater than : Y

Less than : Z

Out of the four alternatives given in these questions, only one is correct according to the above letter symbols. Identify the correct answer.

8. (1) 2 Z 2 A 4 O 1 A 4 M 8 (2) 8 Y 2 A 3 A 4 Q 2 A 4

(3) 10 X 2 O 2 A 4 O 1 M 2 (4) 12 X 4 O 2 Q 1 A 4 A 2

9. (1) 1 O 1 Q 1 M 1 Y 3 Q 1 (2) 2 Q 1 O 10 A 1 Z 6 A 4
(3) 3 O 2 O 10 Q 2 X 10 A 2 (4) 5 Q 5 A 5 O 5 Y 5 A 2

10. (1) 3 O 2 X 2 Q 1 A 3 O 1 (2) 6 M 2 Y 10 Q 2 A 3 O 1
(3) 10 A 2 Z 2 Q 2 A 10 Q 2 (4) 10 A 2 Y 2 Q 1 A 10 Q 2

11. (1) 32 X 8 Q 2 A 3 Q 1 A 2 (2) 14 X 2 A 4 A 2 M 2 Q 1
(3) 2 Y 1 A 1 Q 1 O 1 A 1 (4) 16 Y 8 A 3 O 1 A 2 M 2

12. (1) 8 Q 4 A 1 M 2 X 16 M 16 (2) 8 O 2 A 12 Q 10 X 18 Q 9
(3) 6 Q 2 O 1 O 1 X 16 A 1 (4) 2 O 3 M 4 Q 2 Z 1 A 2

13. If $\div$ means $\times$, $\times$means +, + means – and – means $\div$, find the value of $16 \times 3 + 5 - 2 \div 4$.
(1) 9 (2) 10 (3) 19 (4) None of these

14. If + means $\div$, $\div$ means –, – means $\times$, $\times$means +, then $12 + 6 \div 3 - 2 \times 8 =$?
(1) –2 (2) 2 (3) 4 (4) 8

15. If P denotes $\div$, Q denotes $\times$, R denotes + and S denotes –, then what is the value of 18 Q 12 P 4 R 5 S 6?
(1) 53 (2) 59 (3) 63 (4) 65

16. If P means 'division', T means 'addition', M means 'subtraction' and D means 'multiplication', then what will be the value of the expression 12 M 12 D 28 P 7 T 15?
(1) – 30 (2) – 15 (3) 15 (4) None of these

17. If P means $\times$, R means +, T means $\div$ and S means –, then 18 T 3 P 9 S 8 R 6 =?
(1) $-1\frac{1}{3}$ (2) $\frac{2}{3}$ (3) 46 (4) None of these

18. If P denotes 'multiplied by', T denotes 'subtracted from', M denotes 'added to' and B denotes 'divided by', then 28 B 7 P 8 T 6 M 4 =?
(1) $-\frac{3}{2}$ (2) 30 (3) 32 (4) 34

BRAIN TEASERS

19. If '+' means 'divided by', '–' means 'add', '×' means 'minus' and '/' means 'multiplied by', what will be the value of the following expression?

$[\{(17 \times 12) - (4/2)\} + (23 - 6)]/0$

(1) Infinite (2) 0 (3) 118 (4) 219

20. If L denotes $\div$, M denotes $\times$, P denotes + and Q denotes –, then which of the following statements is true?

(1) 32 P 8 L 16 Q 4 = $-\frac{3}{2}$ (2) 6 M 18 Q 26 L 13 P 7 = $\frac{173}{13}$

(3) 11 M 34 L 17 Q 8 L 3 = $\frac{38}{3}$ (4) 9 P 9 L 9 Q 9 M 9 = – 71

ANSWERS

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	4	4	1	4	3	3	4	1	2	4
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	2	1	1	3	1	4	4	2	2	4

6.2 Interchange of signs and number

Solved examples

Ex.1 If the given interchanges namely : signs + and ÷ and numbers 2 and 4 are made in signs and numbers, which one of the following four equations would be correct?

(1) $2 + 4 \div 3 = 3$ (2) $4 + 2 \div 6 = 1.5$

(3) $4 \div 2 + 3 = 4$ (4) $2 + 4 \div 6 = 8$

Sol. Interchanging (+ and ÷) and (2 and 4), we get :

(1) $4 \div 2 + 3 = 3$ or $5 = 3$, which is false.

(2) $2 \div 4 + 6 = 1.5$ or $6.5 = 1.5$, which is false.

(3) $2 + 4 \div 3 = 4$ or $\frac{10}{3} = 4$, which is false.

(4) $4 \div 2 + 6 = 8$ or $8 = 8$, which is true.

Hence, the answer is (4).

Ex.2 Which one of the four interchanges in signs and numbers would make the given equation correct?

$3 + 5 - 2 = 4$

(1) + and –, 2 and 3 (2) + and –, 2 and 5

(3) + and –, 3 and 5 (4) None of these

Sol. By making the interchanges given in (1), we get the equation as $2 - 5 + 3 = 4$ or $0 = 4$, which is false.

By making the interchanges given in (2), we get the equation as $3 - 2 + 5 = 4$ or $6 = 4$, which is false.

By making the interchanges given in (3), we get the equation as $5 - 3 + 2 = 4$ or $4 = 4$, which is true.

Hence, the answer is (3).

EXERCISE

Directions (Q.1 to Q.4) : In each of the following questions, if the given interchanges are made in signs and numbers, which one of the four equations would be correct?

1. Given interchanges : Signs – and ÷ and numbers 4 and 8.

(1) $6 - 8 \div 4 = -1$ (2) $8 - 6 \div 4 = 1$

(3) $4 \div 8 - 2 = 6$ (4) $4 - 8 \div 6 = 2$

2. Given interchanges : Signs + and × and numbers 4 and 5.

(1) $5 \times 4 + 20 = 40$ (2) $5 \times 4 + 20 = 85$

(3) $5 \times 4 + 20 = 104$ (4) $5 \times 4 + 20 = 95$

3. Given interchanges : Signs + and – and numbers 4 and 8.

(1) $4 + 8 - 12 = 18$ (2) $4 - 8 + 12 = 0$

(3) $8 + 4 - 12 = 24$ (4) $8 - 4 + 12 = 8$

4. Given interchanges : Signs – and × and numbers 3 and 6.

(1) $6 - 3 \times 2 = 9$ (2) $3 - 6 \times 8 = 10$

(3) $6 \times 3 - 4 = 15$ (4) $3 \times 6 - 4 = 33$

Direction (Q.5 to Q.7) : In each of the following questions, the two expressions on either side of the sign (=) will have the same value if two terms on either side or on the same side are interchanged. The correct terms to be interchanged have been given as one of the four alternatives under the expressions. Find the correct alternative in each case.

5. $7 \times 2 - 3 + 8 \div 4 = 5 + 6 \times 2 - 24 \div 3$

(1) 2, 6 (2) 6, 5 (3) 3, 24 (4) 7, 6

6. $15 + 3 \times 4 - 8 \div 2 = 8 \times 5 + 16 \div 2 - 1$

(1) 3, 5 (2) 15, 5 (3) 15, 16 (4) 3, 1

7. $6 \times 3 + 8 \div 2 - 1 = 9 - 8 \div 4 + 5 \times 2$

(1) 3, 4 (2) 3, 5 (3) 6, 9 (4) 9, 5

8. By applying which of the following meanings of arithmetical signs, will the value of

$700 - 10 \div \frac{1}{2} \times 35 + 70$ be zero

(1) $\times$ means $\div$, + means $\times$, $\div$ means +, $-$ means $-$

(2) $\times$ means $-$, + means $\div$, $\div$ means $\times$, $-$ means +

(3) $\times$ means +, + means $-$, $\div$ means $\times$, $-$ means $\div$

(4) $\times$ means $\div$, + means $-$, $\div$ means $\times$, $-$ means +

Direction (Q.9 to Q.14) : In each of the following questions, the given equation becomes correct due to the interchange of two signs. One of the four alternatives under it specifies the interchange of signs in the equation which when made will make the equation correct. Find the correct alternative.

9. $5 + 6 \div 3 - 12 \times 2 = 17$

(1) $\div$ and $\times$ (2) + and $\times$ (3) + and $\div$ (4) + and $-$

10. $2 \times 3 + 6 - 12 \div 4 = 17$

(1) $\times$ and + (2) + and $-$ (3) + and $\div$ (4) $-$ and $\div$

11. $16 - 8 \div 4 + 5 \times 2 = 8$

(1) $\div$ and $\times$ (2) $-$ and $\div$ (3) $\div$ and + (4) $-$ and $\times$

12. $9 + 5 \div 4 \times 3 - 6 = 12$

(1) + and $\times$ (2) $\div$ and $\times$ (3) $\div$ and $-$ (4) + and $-$

13. $12 \div 2 - 6 \times 3 + 8 = 16$

(1) $\div$ and + (2) $-$ and + (3) $\times$ and + (4) $\div$ and $\times$

14. $10 + 10 \div 10 - 10 \times 10 = 10$

(1) + and $-$ (2) $-$ and $\div$ (3) + and $\times$ (4) $\div$ and +

Direction (Q.15 to Q.18) : In each of the following questions, which one of the four interchanges in signs and numbers would make the given equation correct?

15. $6 \times 4 + 2 = 16$

(1) + and $\times$, 2 and 4 (2) + and $\times$, 2 and 6

(3) + and $\times$, 4 and 6 (4) None of these

16. $(3 \div 4) + 2 = 2$

(1) + and ÷, 2 and 3 (2) + and ÷, 2 and 4

(3) + and ÷, 3 and 4 (4) No interchange, 3 and 4

17. $4 \times 6 - 2 = 14$

(1) × to ÷, 2 and 4 (2) − to ÷, 2 and 6

(3) − to +, 2 and 6 (4) × to +, 4 and 6

18. $(6 \div 2) \times 3 = 0$

(1) ÷ and ×, 2 and 3 (2) × to −, 2 and 6

(3) ÷ and ×, 2 and 6 (4) × to −, 2 and 3

BRAIN TEASERS

Direction (Q.19 & Q.20) : In each of the following questions, the two expressions on either side of the sign (=) will have the same value if two terms on either side or on the same side are interchanged. The correct terms to be interchanged have been given as one of the four alternatives under the expressions. Find the correct alternative in each case.

19. $5 + 3 \times 6 - 4 \div 2 = 4 \times 3 - 10 \div 2 + 7$

(1) 4, 7 (2) 5, 7 (3) 6, 4 (4) 6, 10

20. $8 \div 2 \times 5 - 11 + 9 = 6 \times 2 - 5 + 4 \div 2$

(1) 5, 9 (2) 8, 5 (3) 9, 6 (4) 11, 5

ANSWERS

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	3	3	2	2	4	1	4	3	1	1
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	2	3	2	3	3	1	3	4	3	3

6.3 Deriving the appropriate conclusions

In this type of questions, certain relations between different sets of elements is given (in terms of 'less than',' greater than' or 'equal to'), using either the real symbols or substituted symbols. The candidate is required to analyse the given statements and then decide which of the relations given as alternatives follows from those given in the statements.

Solved examples

Ex.1 If A + B > C + D and B + C > A + D, then it is definite that

(1) D > B (2) C > D (3) A > D (4) B > D

Sol. Given : A + B > C + D ...(i) and B + C > A + D ...(ii)

Adding (i) and (ii), we get :

(A + B) + (B + C) > (C + D) + (A + D)

$\Rightarrow$ A + 2B + C > C + 2D + A $\Rightarrow$ 2B > 2D $\Rightarrow$ B > D. Hence, the answer is (4).

Ex.2 It being given that $\times$denotes 'greater than ', ϕ denotes 'equal to' < denotes 'not less than', $\perp$ denotes 'not equal to', Δ denotes 'less than' and + denotes 'not greater than', choose the correct statement from the following :

If a $\times$b Δ c, it follows that

(1) a ϕ c Δ b (2) b < a $\times$c (3) a < b + c (4) c + b < a

Sol. Using the usual notation, we have :

(1) The statement is a > b < c $\Rightarrow$ a = c < b, which is false. [$\because$ c > b]

(2) The statement is a > b < c $\Rightarrow$ b $\not<$ a > c, which is false. [$\because$ b < a]

(3) The statement is a > b < c $\Rightarrow$ a $\not<$ b $\not>$ c, which is true.

(4) The statement is a > b < c $\Rightarrow$ c $\not>$ b $\not<$ a, which is false. [$\because$ b < a]

Hence, the answer is (3).

Ex.3 In the following questions, the symbols @, ©, $, % and # are used with the following meanings as illustrated below:

(i) 'A $ B' means 'A is not smaller than B';

(ii) 'A # B' means 'A is not greater than B';

(iii) 'A @ B' means 'A is neither smaller than nor equal to B';

(iv) 'A © B' means 'A is neither smaller than nor greater than B';

(v) 'A % B' means 'A is neither greater than nor equal to B'

Now, in each of the following questions, assuming the given statements to be true, find which of the three conclusions I, II and III given below them is/are definitely true and give your answer accordingly.

1. Statements : H % J, J © N, N @ R

Conclusions : I. R % J II. H @ J III. N @ H

(1) Only I is true (2) Only II is true (3) Only III is true (4) Only I and III are true

Sol. Given statements : H < J, J = N, N > R.

I Relation between R and J :

R < N, N = J $\Rightarrow$ R < N = J $\Rightarrow$ R < J i.e. R % J.

II Relation between H and J : H < J i.e. H % J.

III Relation between N and H :

N = J, J > H $\Rightarrow$ N = J > H $\Rightarrow$ N > H i.e. N @ H.

So, only I and III are true. Hence, the answer is (4).

2. Statements : M @ J, J $ T, T © N

Conclusions : I. N # J II. T % M III. M @ N

(1) None is true (2) Only I and II are true (3) Only II and III are true (4) All are true

Sol. Given statements : M > J, J ≥ T, T = N

I Relation between N and J :

N = T, T ≤ J ⇒ N = T ≤ J ⇒ N ≤ J i.e. N # J.

II Relation between T and M :

T ≤ J, J < M ⇒ T ≤ J < M ⇒ T < M i.e. T % M

III Relation between M and N :

M > J, J ≥ T, T = N ⇒ M > J ≥ T = N ⇒ M > N i.e. M @ N.

Thus, all I, II and III are true. Hence, the answer is (4).

3. Statements : D © K, K# F, F @ P

Conclusions : I. P @ D II. K # P III. F $ D

(1) Only I and II are true (2) Only II is true

(3) Only II and III are true (4) Only III is true

Sol. Given statements : D = K, K ≤ F, F > P

I Relation between P and D :

P < F, F ≥ K, K = D ⇒ P < F, F ≥ D ⇒ P < F ≥ D ⇒ No definite conclusion.

II Relation between K and P :

K ≤ F, F > P ⇒ K ≤ F > P ⇒ No definite conclusion.

III Relation between F and D :

F ≥ K, K = D ⇒ F ≥ K = D ⇒ F ≥ D i.e. F $ D.

Thus, only III is true. Hence, the answer is (4).

4. Statements : R # D, D $ M, M © N

Conclusions : I. R # M II. N # D III. N $ R

(1) Only I is true (2) Only II is true (3) Only III is true (4) None is true

Sol. Given statements : R ≤ D, D ≥ M, M = N

I Relation between R and M :

R ≤ D, D ≥ M ⇒ R ≤ D ≥ M ⇒ No definite conclusion.

II Relation between N and D :

N = M, M ≤ D ⇒ N = M ≤ D ⇒ N ≤ D i.e. N # D.

III Relation between N and R :

N = M, M ≤ D, D ≥ R ⇒ N = M ≤ D ≥ R ⇒ No definite conclusion.

Thus, only II is true. Hence, the answer is (2).

5. Statements : K © P, P @ Q, Q $ R

Conclusions : I. K @ R II. R % P III. Q % K

(1) Only I and II are true (2) Only II and III are true

(3) Only III is true (4) All are true

Sol. Given statements : K = P, P > Q, Q ≥ R

I Relation between K and R :

K = P, P > Q, Q ≥ R ⇒ K = P > Q ≥ R ⇒ K > R i.e. K @ R.

II Relation between R and P :

R ≤ Q, Q < P ⇒ R ≤ Q < P ⇒ R < P i.e. R % P.

III Relation between Q and K :

Q < P, P = K ⇒ Q < P = K ⇒ Q < K i.e. Q % K.

Thus, all I, II and III are true. Hence, the answer is (4).

6. Statements : K # N, N $ T, T % J.

Conclusions : I. J @ N II. K @ T III. T @ K

(1) None is true (2) Only I and II are true

(3) Only II and III are true (4) Only I and III are true

Sol. Given statements : K ≤ N, N ≥ T, T < J.

I Relation between J and N :

J > T, T ≤ N ⇒ J > T ≤ N ⇒ no definite conclusion.

II & III Relation between K and T :

K ≤ N, N ≥ T ⇒ K ≤ N ≥ T ⇒ no definite conclusion.

Thus, none of I, II and III is true. Hence, the answer is (1).

7. Statements : M @ D, D © V, V $ W

Conclusions : I. W @ M II. M % V III. D $ W

(1) Only I and II are true (2) Only II and III are true

(3) Only III is true (4) Only I and III are true

Sol. Given statements : M > D, D = V, V ≥ W

I Relation between W and M :

W ≤ V, V = D, D < M ⇒ W ≤ V = D < M ⇒ W < M i.e. W % M.

II Relation between M and V :

M > D, D = V ⇒ M > D = V ⇒ M > V i.e. M @ V.

III Relation between D and W :

D = V, V ≥ W ⇒ D = V ≥ W ⇒ D ≥ W i.e. D $ W.

Thus, only III is true. Hence, the answer is (3).

EXERCISE

1. If A > B, B > C and C > D, then which of the following conclusions is definitely wrong?
(1) A > D (2) A > C (3) D > A (4) B > D

2. If A + B > C + D, B + E = 2C and C + D > B +E, it necessarily follows that
(1) A + B > 2E (2) A + B > 2C (3) A > C (4) A + B > 2D

3. If A + B = C + D and A + D > B + C, then which one of the following is definitely wrong?
(1) A > B (2) A > C (3) C > D (4) B > D

Direction (Q.4 & Q. 5) : In these questions, some symbols have been used for some mathematical operations as indicated below :

× for 'greater than'; © for 'not less than'; ÷ for 'not equal to'; ϕ for 'equal to'; + for 'not greater than'; Δ for 'less than'.

Using these symbols, choose the correct alternative in each of the following questions.

4. If a © b ×c, it implies that
(1) a © b ϕ c (2) a Δ b © c (3) a ×c + b (4) c ×b ×a

5. If a ×b Δ c, it follows that
(1) c + b © a (2) a © b + c (3) b © a ×c (4) a ϕ c Δ b

Direction (Q.6 to Q.9) : In the following questions, the symbols ⋆, %, $, # and © are used with the following meanings as illustrated below.

(i) 'P $ Q' means 'P' is smaller than Q';

(ii) 'P ⋆ Q' means 'P' is neither smaller than nor greater than Q';

(iii) 'P # Q' means 'P' is either greater than or equal to Q';

(iv) 'P % Q' means 'P' is greater than Q';

(v) 'P © Q' means 'P' is either smaller than or equal to Q';

Now, in each of the following questions, assuming the given statements to be true, find which of the two conclusions I and II given below them is/are definitely true?

Give answer (1) if only conclusion I is true; (2) if only conclusion II is true; (3) if either conclusion I or II is true; (4) if neither conclusion I nor II is true.

6. Statements : B # D, D ⋆ F, F % H
Conclusions : I. F ⋆ B II. F $ B

7. Statements : H $ J, J ⋆ N, N # T
Conclusions : I. T % H II. J # T

8. Statements : W © F, F % R, R # K
Conclusions : I. W $ K II. K ⋆ W

9. Statements : V © R, R $ M, M ⋆ W
Conclusions : I. W % V II. V © W

Direction (Q.10 to Q.15) : In these questions, the symbols @, ©, %, ⋆ and $ are used with the following meanings as illustrated below:

(i) 'P @ Q' means 'P is either greater than or equal to Q';

(ii) 'P © Q' means 'P is either smaller than or equal to Q';

(iii) 'P % Q' means 'P is greater than Q';

(iv) 'P ⋆ Q' means 'P is smaller than Q';

(v) 'P $ Q' means 'P is neither greater than nor smaller than Q'.

Now, in each of the following questions, assuming the given statements to be true, find which of the two conclusions I and II given below them is/are definitely true?

Give answer (1) if only conclusion I is true; (2) if either conclusion I or II is true; (3) if neither I nor II is true; and (4) if both conclusions I and II are true.

10. Statements : M @ R, R % T, T $ K
Conclusions : I. K ⋆ M II. T ⋆ M

11. Statements : H % J, B © J, B @ F
Conclusions : I. F $ J II. J % F

12. Statements : D $ M, M % W, W @ R
Conclusions : I. R ⋆ D II. W © D

13. Statements : A © N, N ★ V, V $ J
Conclusions : I. J @ N II. A © V

14. Statements : K ★ T, T @ B, B © M
Conclusions : I. M % T II. K© B

15. Statements: W © R, J@R, J ★ K
Conclusions : I. J @ W II. K% R

16. If A + D = B + C, A + E = C + D, 2C < A + E and 2A > B + D, then
(1) A > B > C > D > E (2) B > A > D > C > E
(3) D > B > C > A > E (4) B > C > D > E > A

BRAIN TEASERS

17. Find the correct inference according to given premises and symbols:
A : Not greater than B : Greater than C : Not equal to D : Equal to
E : Not less than F : Less than
Premises : (ℓCm) and (ℓAm)
(1) ℓBm (2) ℓDm (3) ℓEm (4) ℓFm

18. If A + D > C + E, C + D = 2 B and B + E > C + D, it necessarily follows that
(1) B + D > C + E (2) A + B > 2D
(3) A + D > B + E (4) A + D > B + C

Direction (Q.19 & Q.20) : In these questions, some symbols have been used for some mathematical operations as indicated below :

× for 'greater than'; © for 'not less than'; ÷ for 'not equal to'; ϕ for 'equal to'; + for 'not greater than'; Δ for 'less than'.

19. If a Δ b Δ c, it does not imply that
(1) a × c × b (2) a Δ c × b (3) c × b × a (4) b × a Δ c

20. If a × b + c, it implies that
(1) a Δ b ϕ c (2) a Δ b Δ c (3) c ϕ b Δ a (4) a ϕ b Δ c

ANSWERS

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	3	2	4	3	2	3	2	4	1	4
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	2	1	3	3	4	2	4	4	1	3

EXERCISE

QUESTIONS RELATED TO VARIOUS OLYMPIADS

1. If α stands for 'equal to' ; β for 'greater than', γ for 'less than' and δ for 'not equal to' and a b x y α c^2 z, b x β a y & b^2 α a c are true then which of the following is true?

(1) a x^2 β c z (2) a^2 x^2 β c z (3) b^2 x β c^2 z (4) b x^2 β c^2 z

2. If A % B means 'A multiplied by B' ;

A @ B means 'A minus B'

A $ B means 'A plus B'

A # B means 'A divided by B'

Then what will be the total area of 21 circles, each with the same radius of r cm?

(1) 22% r% 7% r# 21 (2) 22 # 21% r% r

(3) 66% r^2 # 7 (4) 66% r% r

3. If 324 ×150 = 54, 251 ×402 = 48 and 523 ×345 = 120, then 651 ×345 =?

(1) 120 (2) 85 (3) 144 (4) 60

4. If + means ×, –means ÷, ×means –, ÷ means + then 6 + 5 ÷ 5 –3 ×6 =?

(1) $25\frac{2}{3}$ (2) $15\frac{2}{3}$ (3) $14\frac{1}{3}$ (4) $19\frac{1}{3}$

5. If + means ×, ×means –, – means ÷, ÷ means + then 5 + 3 ÷ 12 – 6 ×9 =?

(1) 9 (2) 6 (3) 8 (4) 7

6. If P means '÷', R means '+', T means '–' and M means '×' then 64 R 16 P 8 M 5 T 6 =

(1) 68 (2) 324 (3) 44 (4) 80

7. If '+' stands for 'division', 'x' stands for 'addition', '–' stands for 'multiplication' and ' ÷ ' stands for 'subtraction', then which of the following equations is correct?

(1) 36 × 6 + 7 ÷ 2 – 6 = 20 (2) 36 ÷ 6 + 3 × 5 – 3 = 45

(3) 36 + 6 – 3 ×5 ÷ 3 = 24 (4) 36 – 6 + 3 × 5 ÷ 3 = 74

8. If 'a' means 'plus', 'b' means 'minus', 'c' means 'multiplied by' and 'd' means 'divided by' then 18 c 14 a 6 b 16 d 4 =?

(1) 63 (2) 254 (3) 288 (4) 1208

Direction (Q.9 to Q.10) : It being given that : Δ denotes 'equal to'; $\square$ denotes 'not equal to'; + denotes 'greater than'; – denotes 'less than'; × denotes 'not greater than'; ÷denotes 'not less than'.

Choose the correct statement in each of the following questions :

9. a + b – c implies

(1) b – c – a (2) c – b + a (3) c + b – a (4) c × b ÷a

10. a × b ÷c implies

(1) a – b + c (2) c ×b ÷a (3) a $\square$ b $\square$ c (4) b ÷ a ÷c

ANSWERS

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	1	4	3	1	3	1	4	2	3	2